

Appl. No. 10/084,320
Amdt. Dated April 30, 2004
Reply to Office action of December 30, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) An apparatus for humidifying ~~a~~first and second process gas streams, for a fuel cell, the apparatus comprising:

a steam supply line;

a first humidification unit having an inlet for the first process gas stream and a first steam injector-supply means connected to the steam supply line, for injecting supplying steam into the first process gas stream, to add humidity to the first process gas stream at a first temperature, to a humidity well in excess of a required humidity level;

a first heat exchanger connected to the humidification unit, for cooling the process gas stream to a second, lower temperature, whereby excess moisture in the first process gas stream condenses;

a separator connected to the first heat exchanger, for removing the condensed moisture, whereby the first process gas stream leaving the separator has a known temperature and a known humidity level; and

a first heater connected to the separator, for heating the process gas stream to a third temperature, greater than the second temperature, whereby the process gas stream has a known absolute humidity level;

a second humidification unit including an inlet for the second process gas stream and a second steam supply means connected to the steam supply line, for supplying steam into the second process gas stream, to add humidity to the second process gas stream at a fourth temperature, to a humidity well in excess of a required humidity level;

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a second heat exchanger connected to the humidification unit, for cooling the second process gas stream to a fifth, lower temperature, whereby excess moisture in the second process gas stream condenses;

a second separator connected to the second heat exchanger, for removing the condensed moisture, whereby the second process gas stream leaving the second separator has a known temperature and a known humidity level;

a second heater connected to the second separator, for heating the second process gas stream to a sixth temperature, greater than the fifth temperature, whereby the second process gas stream has a known absolute humidity level; and

wherein the first and second heat exchangers are arranged for heat to be removed therefrom by a common coolant supply.

2. (cancelled)

3. (cancelled)

4. (currently amended) An apparatus as claimed in claim 1, which includes at least one of a first~~an~~ outlet line connected to the first heater and an first elongate heating means provided for the first outlet line, for maintaining the outlet line at the third temperature, and a second outlet line connected to the second heater and a second elongate heating means provided for the second outlet line, for maintaining the second outlet line at the sixth temperature.

5. (currently amended) An apparatus as claimed in claim 4, where each of the first and the second~~the~~ elongate heating means comprises an elongate electrical heating elements.

6. (cancelled)

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7. (currently amended) An apparatus as claimed in claim 1, wherein the first heat exchanger includes a first temperature control circuit, for controlling the temperature of the first heat exchanger, the first temperature control circuit comprising a first conduit for a first fluid, a first pump for pumping the first fluid, and a first cooling means for cooling the first fluid and connected to the coolant supply.

8. (currently amended) An apparatus as claimed in claim 7, wherein the first ~~cooling~~ temperature control circuit additionally includes a ~~further~~one fluid heater for heating the first fluid.

9. (currently amended) An apparatus as claimed in claim ~~4 or 7~~17, wherein the first heater comprises a ~~second~~third heat exchanger, and wherein the ~~second~~third heat exchanger is provided with a ~~second~~third temperature control circuit for controlling the temperature of the ~~second~~third heat exchanger, the ~~second~~third temperature control circuit comprising a third conduit for a ~~second~~third fluid, a third pump for ~~circulating~~ pumping the third fluid and a third heater for heating the ~~second~~third fluid.

10. (cancelled)

11. (currently amended) An apparatus as claimed in claim ~~10~~21 wherein the steam supply line includes at least one of a shut off valve, a trap for separating out condensed moisture and a pressure regulating valve.

12. (currently amended) An apparatus as claimed in claim 11, wherein the steam line includes two separate lines, one connected to the first-mentioned humidification unit and the other connected to the ~~other~~second humidification unit, wherein each separate steam line includes a shut off valve, a pressure regulating valve and, adjacent the respective steam ~~injectors~~supply means, a non return valve.

13. (cancelled)

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14. (cancelled)

15. (cancelled)

16. (cancelled)

17. (new) An apparatus as claimed in claim 8, wherein the second heat exchanger includes a second temperature control circuit, for controlling the temperature of the second heat exchanger, the second temperature control circuit comprising a second conduit for a second fluid, a second pump for pumping the second fluid, and a second cooling means for cooling the second fluid and connected to the coolant supply.

18. (new) An apparatus as claimed in claim 17, wherein the second temperature control circuit additionally includes another fluid heater, for heating the second fluid.

19. (new) An apparatus as claimed in claim 9, wherein the second heater comprises a fourth heat exchanger, and wherein the fourth heat exchanger is provided with a fourth temperature control circuit for controlling the temperature of the fourth heat exchanger, the fourth temperature control circuit comprising a fourth conduit for a fourth fluid, a fourth pump for pumping the fourth fluid and a fourth heater for heating the fourth fluid.

20. (new) An apparatus as claimed in claim 19, wherein the third and fourth cooling circuits include respective third and fourth cooling means for cooling the third and fourth fluids, wherein the coolant supply means is connected to the third and fourth cooling means, for removing heat therefrom.

21. (new) An apparatus as claimed in claim 20, wherein each of the first, second, third and fourth fluids comprises water, and the coolant supply comprises a supply of coolant water.

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22. (new) An apparatus as claimed in claim 1, 17, 19 or 20, wherein each of the steam supply means comprises a steam injector.